Code.No: 45106 | R07 | SET-3

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
III.B.TECH - I SEMESTER REGULAR EXAMINATIONS NOVEMBER, 2009
CONTROL SYSTEMS
(Common to EIE, AE)

Time: 3hours **Max.Marks:80**

Answer any FIVE questions
All questions carry equal marks
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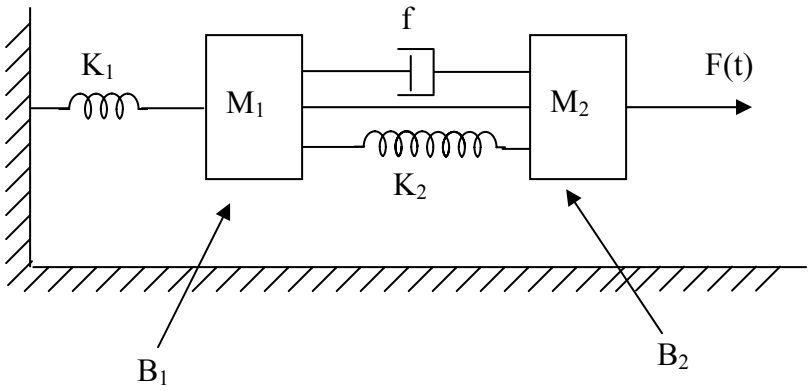
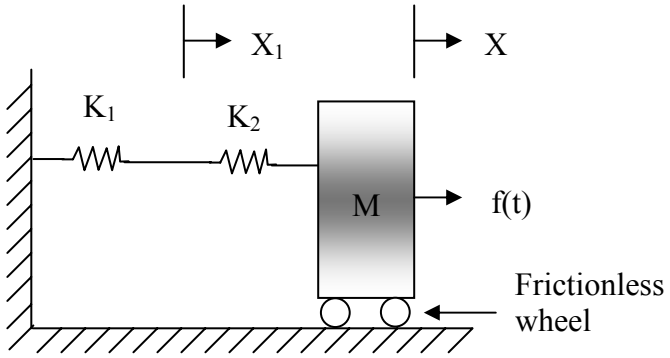
1.a) Explain Regenerative feedback system with an example.
b) Obtain the transfer function of the mechanical system shown and draw the force-voltage analogy circuit. [8+8]



2.a) Obtain the transfer function of the following system and draw its analogous electrical circuit.



b) Explain the advantages and features of transfer function. [8+8]

3.a) The open-loop transfer function of a unity feedback system is given by.

$$G(s)=\frac{500}{s(1+0.1s)}$$

Find the peak overshoot and time peak overshoot. If peak overshoot is to be reduced by 20%, what is the change in the gain ?

b) Find the Error coefficients for step, ramp and parabolic inputs for unity feed-back system having the forward transfer function [8+8]

$$G(s)=\frac{14(s+3)}{s(s+5)(s^2+2s+2)}$$

4. Obtain the root locus plot for the system whose open loop transfer function is

$$G(s)=\frac{K}{s(s+1)(s^2+2s+2)}$$

For what range of 'K' the system is stable? Give the steps followed for construction of Root locus. [16]

5.a) Define frequency response.

b) Discuss the advantages & disadvantages of frequency response analysis.

c) Bring out the correlation between time response & frequency response and hence show that the correlation exists for the range of damping ratio $0 < \zeta < 0.707$.

[2+6+8]

6.a) What is "Nyquist Contour"?

b) A system is given by $G(s) = \frac{4s+1}{s^2(s+1)(2s+1)}$ Sketch the Nyquist plot & hence determine the stability of the system. [4+12]

7. Design a lead compensator for unity feed back system whose open loop transfer function $G(S) = \frac{K}{s(s+1)(s+5)}$ to satisfy the following specifications.

i) Velocity error constant $K_V \geq 50$

ii) Phase margin $\geq 20^0$. [16]

8.a) Obtain the state model of the system whose transfer function is given as

$$\frac{Y(s)}{V(s)}=\frac{10}{s^3+4s^2+2s+1}$$

b) Consider the matrix . Compute e^{At}?

$$A=\begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}$$ [8+8]

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